

Eighteenth Century Deer Numbers and Pine Regeneration Near Braemar, Scotland

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ABSTRACT

The Earl of Fife's diary in 1783–92 offers a useful insight into the history of natural pine woods near Braemar. This case also illustrates the general point that old manuscript sources can provide information useful to those tackling modern management problems. In the earlier years the Earl often complained about red deer being scarce, and took severe action against poaching. The success of his shooting rose, and deer numbers seen by him increased greatly. He noted young pines in places where none exists today. Most trees alive today date from that time, and deer have prevented regeneration since.

INTRODUCTION

Some of the finest relics of Old Caledonian Forest in the Scottish Highlands, mainly Scots pine *Pinus sylvestris* with some birch *Betula pubescens*, stand near Braemar in Aberdeenshire. No regeneration has occurred for decades, in association with severe browsing by numerous red deer *Cervus elaphus*. Gordon (1925) wrote that the deer 'destroy every seedling in Glen Derry and Glen Lui', and that the pines would become extinct unless deer were fenced out. The dying native woods in this area and other parts of the Highlands now pose one of the chief problems for nature conservation in Scotland. As well as being the prime habitats for boreal forest wildlife in Britain, the tracts of old woodland are of high

scenic value and provide an important tourist attraction. The Old Caledonian woods near Braemar are particularly interesting as they have remained virtually unexploited by felling this century, and so contain older trees than in many of the other Old Caledonian relics elsewhere in the Highlands.

Regeneration must have been far better when the present trees first grew. An unpublished diary by the Earl of Fife from 1783–92 (now in Aberdeen University library) offers a useful insight into this. It has the title ‘Journal of the Weather at Marr Lodge’, and Green (1970) discusses the notes on weather. However the journal is mainly about deer shooting. The Earl’s main estates lay in lowland northeast Scotland, and he spent most of the year at Duff House near Banff, at Balvenie near Dufftown in Banffshire, and at Fife House, Whitehall, London. Between May and July he usually spent some days at Mar Lodge near Braemar, supervising estate improvements and on one occasion (between 27 May and 9 June 1791) ‘by way of exercise and amusement destroyed Eagles and Hawkes etc’. From August to October he lived at Mar Lodge and occasionally at shooting bothies higher into the Cairngorms massif. His main interest there was the hunting of red deer by shooting and also by using fast deer hounds, though on some days he went out to shoot roe deer *Capreolus capreolus* or game birds.

On the deer-hunting trips he usually went with one or more ‘foresters’, who were local men paid to work at the deer hunting and also to protect the deer from poaching, and occasionally he took along a guest. As well as giving detailed descriptions of these hunts, the Earl also made comments on deer numbers, trees, and land use. This paper analyses these comments. The information is relevant to those interested in understanding how the present native tree population came about. It is also of more general relevance outside the Scottish Highlands, as it provides an example of how old manuscript sources can give the ecologist or conservationist a historical perspective that is useful for tackling current and future management problems.

METHODS

Number of outings

The Earl noted carefully the number of deer-hunting outings by himself, his guests, and his foresters. As the hunting parties walked almost

everywhere and had long distances to travel, there were very few short outings. Usually an outing lasted most or all of the day, and sometimes into the night. On a few occasions the Earl went out for most of the day, and returned to Mar Lodge, but then walked in the evening to 'the Sheal', a remote shooting bothy 2–3 hours away up Glen Dee, hunting for deer on the way there; I counted this as two outings. Usually, however, there was only one outing per hunting party per day. If the Earl and his head forester went together to one place and then shot at different deer, I regarded this as one outing, but as two outings if they subsequently separated to go to two different hills or glens. However, if one party went to two or more such places successively in one day, I treated this as one outing, there being no other objective way of classifying the information. I regarded one party going out on two different days as being equivalent to two parties going out on the same day (i.e. both as two outings).

Number of sightings of deer

Often the Earl noted the number of occasions when deer were seen by himself, and sometimes by his foresters. Comments on, say, four sightings of separate deer herds on one day and one on each of four days both rate as four in this paper, irrespective of the number of outings. The point of analysing this was to get information on the number of sightings of deer, as a step in calculating the number of deer seen per sighting. The number of sightings itself (for instance, per given hunting season) was not a reliable figure. It was unreliable partly because the Earl did not note deer numbers on every deer-hunting outing, and more importantly because he was inconsistent in this between years. Also, a lack of comments did not always reflect a lack of deer seen.

Number of deer seen

I classified the Earl's notes on the numbers of deer seen, so that they were standardised and comparable. Sometimes he gave the exact, absolute number seen, but usually wrote comments such as 'a few', 'many', etc. Table 1 classifies his comments and counts of absolute numbers into eight grades. Different comments that I have put into the same grade might not have been regarded by him as equivalent. However, the commonest primary comments for the eight grades undoubtedly indicate obvious differences, even though the exact grade for some of the secondary comments may possibly be open to question.

TABLE 1
 Gradings for Comments on Numbers of Deer

<i>Grade</i>	<i>Number of deer</i>	<i>Comments in journal^a</i>
0	0	None
1	1	One
2	2–4	Very few
3	5–13	A few, several
4	14–40	Some, one covey, a number
5	41–121	Many, a good many, herds, numbers, different droves, large flocks
6	122–364	A great many, a great number, great droves, great herds
7	365–1 093	A prodigious number, hundreds, full of deer, vast droves

^a Grades 2–7 also include cases where the Earl gave exact numbers seen, and comments of 'deer' are allocated to grade 4.

If the Earl was out on a hunting outing but did not write about seeing deer, one problem was whether this meant that no deer were seen or that deer were seen but not recorded. In 1787 he made 54 comments on numbers seen during 47 outings, but in the first year in 1784 only 22 comments during 33 outings (Table 2). As he often complained in the early years about deer being scarce or absent, but seldom in later years when deer were more abundant, probably the lack of comments in 1784 on days when no deer were shot meant that he had seen no deer. However, I decided that it was safe to use only the comments that he did make, so in these early years this decision is conservative. In 1789, 1790 and 1792 he went less to the hill, sending out his foresters more, and often did not note deer numbers seen even on days when deer were shot. In 1790 he was ill and made only three comments. However, sufficient comments were made to allow analysis of the number of deer seen per sighting recorded, in different years.

Number of deer killed and wounded

The Earl's journal contains detailed notes on the number of stags and hinds killed, and on incidents where deer were wounded. A big effort was made to find wounded ones that escaped. The Earl and foresters tried to follow a wounded deer and usually spent one or more subsequent days looking for it. Some of these wounded deer were seen alive later and shot dead or killed with the deer hounds. Others were found dead within a day

TABLE 2
Number of Deer-hunting Days, Deer Killed and Wounded, and Deer Seen

	Days ^a	Outings	Extra party out on same day	Stags		Earl's comments on deer scarcity ^c	Median grade ^d for no. of deer seen	
				Killed ^b	Wounded and not recovered		Per day with a comment (n)	Per comment ^e (n)
1784	33	33	0	8	4	9	3 (15)	2 (22)
1785	30	31	1	9	3	5	4 (24)	3 (49)
1786	35	36	1	10	5	4	4 (28)	3 (63)
1787	40	47	5	10	9	7	5 (31)	4 (54)
1788	39	45	6	16	7	0	5 (27)	4 (41)
1789	29	35	6	21	3	0	5.5 (22)	5 (25)
1790	28	35	7	16	1	1	5 (3)	5 (3)
1791	37	41	4	23	3	2	6 (11)	5 (16)
1792 ^f	10	10	0	6	0	0	5 (3)	5 (3)

^a The Earl was not out on 1 day in 1786 and 1790, 2 in 1789, 3 in 1792, and 5 in 1788 and 1791.

^b In addition, 3 hinds killed in 1787 and 2 in 1788.

^c Involving 'no deer', 'very few', and 'only'.

^d See Table 1 for grades.

^e Each comment on numbers has its own grade, e.g. a case of one stag with 20 hinds is given two gradings of 1 and 4, not just one of 4; this is a conservative treatment.

^f The Earl's notes cover only the early part of this season.

Statistical analysis

	r_s
A Stags shot (including those wounded and not recovered), in relation to year	Per day 0.80 Per outing 0.83 Per year 0.85
B Deer killed (including hinds), in relation to year	Per day 0.82 Per outing 0.86
C Comments on deer scarcity (no. of comments divided by no. of days out by the Earl), in relation to year	0.71
D Median grade for no. of deer seen per day with a comment on numbers, in relation to year	0.80
E Median grade for group size (no. of deer seen per comment on numbers), in relation to year	0.95
A, B, D and E are significant at one-tailed $p < 0.01$, and C at < 0.05 , after correcting for ties.	

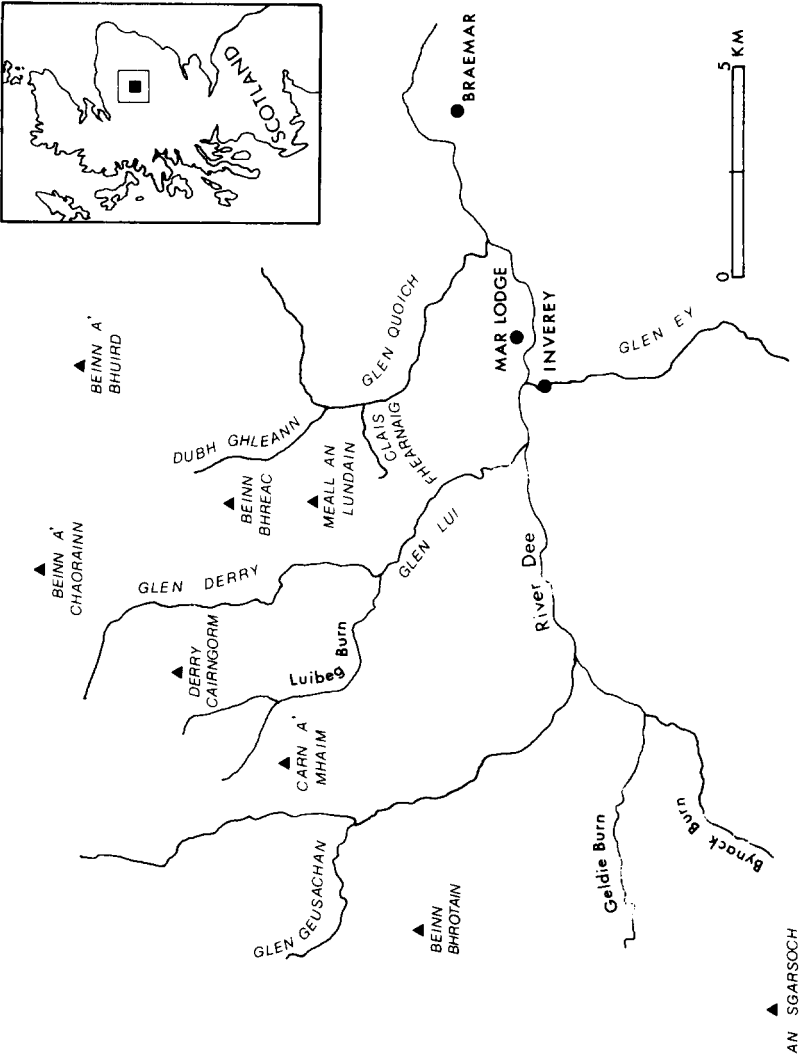


Fig. 1. Map of Mar in west Aberdeenshire.

or two, when they would still have been reasonably fresh; these the foresters took back to Mar Lodge. Two wounded deer were not found by the hunting parties till long after, when they had died and been 'almost all eat' by foxes *Vulpes vulpes* and eagles *Aquila chrysaetos*. Most of the wounded deer that escaped were not found thereafter. A few of these probably recovered; on 26 September 1789 the Earl wrote 'shot another that I had wounded before in the top of the shoulder, ball through but no bone broke so he would have recovered perfectly'.

Other information

The Earl's comments on trees, land use and land management were too few to justify analysis, so I have quoted them or referred to them individually.

Figure 1 shows the places named in this paper, and Steven & Carlisle (1959) give detailed maps and descriptions of the areas of Old Caledonian Forest and other woodland. I obtained information on underlying rocks from the Ordnance Survey's 1:63 360 geological maps, as a guide to major differences in land fertility. During 1948–52 I worked during summer vacations as a deer-stalking ghillie on Mar, and information on locations and number of deer shot during these years is presented here as a contrast with the Earl's days. I also interviewed several old stalkers, crofters and others whose experience there went back to 1880.

RESULTS

Number and location of outings

The annual number of deer-hunting days and outings from 1784 to 1791 changed little (Table 2), increases from one year to the next being balanced more or less by decreases (binomial test, no significant trend up or down).

Deer-hunting visits by the Earl's parties to different parts of what were called in 1945–63 the Derry, Geldie, Home and Ey beats of Mar Lodge totalled 238, 52, 27 and 0 during 1785–92, compared with annual figures (based on pre-arranged quotas) of 50, 50, 25, and 50 stags shot in 1949–52 when I worked there (Table 3). In the Earl's days the Derry beat was the

TABLE 3

Changes in the Proportion of Visits to and Stags Killed on Different Beats of Mar

		<i>Area (ha)^a Derry</i> 7 300	<i>Geldie</i> 8 100	<i>Home</i> 6 100	<i>Ey</i> 14 500
1784	visits	34	8	4	— ^b
1785–92	visits	238 ^c	52	27	0
1784	stags killed	4	1	1	— ^b
1785–92	stags killed ^c	76 ^d	11	7	0
1949–52	stags killed ^e	200 ^d	200	100	200

^a Mostly from Whitehead (1960); he gave Home + Ey combined.^b On August 1785 the Earl wrote that he had bought the lands of Inverey.^c Excluding some with location unstated, shot by the foresters.^d See ^a in Table 4.^e Approximate totals, based on pre-arranged quotas.Stags killed on Derry versus other beats between 1784 and 1949, $\chi^2 = 2.41$, one-tailed $p < 0.1$; between 1791 and 1949, $\chi^2 = 9.12$, $p < 0.005$.

only one with no human inhabitants, and with the highest, barest, least fertile and least grassy ground. It probably had fewest sheep and cattle, and was least accessible to poachers. The relatively grassy hills south of the village of Inverey, later to become one of the best parts of Mar for deer, were not regarded as deer forest, and Glen Ey held farming communities. The Earl went there only to shoot red grouse *Lagopus lagopus scoticus*, and made no comments about seeing deer. On 20 September 1785 he wrote that the glens there had 'fine pasture . . . shot a brace of Moor Game (i.e. red grouse) . . . very few there owing to burning and Potchers'.

Even within the Derry beat, the hunters' favourite hills have also changed (Table 4). In the Earl's days they preferred the heathy Carn a' Mhaim, Derry Cairngorm, and other high hills in that part of the Dee watershed west of the Derry and north of the Geusachan and lower Luibeg. These hills all lie over granite, a poor rock which in this area supports thin soils, with much bare ground in the form of boulders and gravel. They went less often to the less bare, less heathy and more grassy ground east of the Derry, much of which lies over the richer rocks of diorite and schist, with deeper, more fertile soils. They seldom visited Meall an Lundain, though it was the most accessible part of the Derry area to Mar Lodge and the lowest-altitude hill on Derry; it all lies over schist with some limestone, and is today the least bare hill on Derry, with

TABLE 4
Percentage of Deer-stalking Visits to Different Parts of the Derry Beat

<i>West or east of Derry Burn</i>	<i>Underlying rock</i>	<i>Area</i>	<i>1784-92 n = 270^a</i>	<i>1948-52 n = 165</i>
West	Granite	Derry Cairngorm-Derry	24	10
		Carn a' Mhaim	16	3
		Other areas northwest of Derry-Lui junction	22	3
East	Schist, diorite, some limestone	Beinn Bhreac	13	8
		Beinn a' Chaorainn	5	10
		Beinn a' Bhuird-Dubh Ghleann	6	18
		Quoich	9	13
		Rich ground northwest of Beinn Bhreac	3	18
		Meall an Lundain-Clais Fhearnaig	1	18

^a Omitting Glen Geusachan and Devil's Point, which were a deer sanctuary with no shooting in 1948-52.

Changes in the proportion of visits on west block entirely over granite, versus east block partly over granite and partly over richer rocks, 21 versus 11 in 1784, 6 versus 36 in 1949, $\chi^2 = 18.50$, $p < 0.001$ (1949 was the first of the later years to have complete data).

some fertile grassland. By contrast, when I worked there in 1948-52 the stalkers favoured the eastern Beinn a' Bhuird-Beinn a' Chaorainn area and the rich ground northwest of Beinn Bhreac, and visited Meall an Lundain more than any single hill on Derry.

To sum up, the Earl found it worth hunting red deer on only about half of the ground used for deer stalking in the late 19th and 20th centuries. His favourite hunting areas lay on the central part of the Cairngorms massif, on high, rough ground over infertile granite, far from the main habitations of people in Glen Ey and at Inverey and elsewhere in the main Dee valley.

Number of deer seen

The median grade for numbers seen on deer-hunting days rose from three in 1784 to six in 1791 (Table 2). As the grades form a threefold system on a geometric scale (Table 1), this is equivalent to about 10 deer per day in

1784 and over 100 in 1791, a big increase. In 1788 he noted over 300 on one occasion, and in later years made many comments such as 'a prodigious number', 'hundreds', or 'vast droves'. In summer too, he wrote of 80 stags constantly on the green at Mar Lodge in July 1790, and in May 1791 'great numbers constantly near the house and often laying the whole day on the green'. On 3 October 1791 he noted 'the number of Deer increasing greatly every year'. His comments on deer scarcity decreased over the years, and the group size of the deer rose (Table 2).

Number of deer killed and wounded

From 1784–91, the number of deer killed and the number killed per day and per outing increased more than two-fold, and the number of stags shot per day and per outing (including wounded ones) also rose greatly (Table 2). The proportion of days with two parties out on the same day increased, another indication of success.

Altogether the Earl's parties killed 119 stags; these included those wounded and lost temporarily, but killed by the hunters on subsequent days. They wounded and lost for good another 35. Up to 1788, this last category of loss ran at about half of the number killed, later falling to about a tenth. On the same area in 1948–52 when I worked there, the rate wounded and lost by incoming shooters ran at 5% out of 242, and by resident stalkers 2% out of 110. Of course 20th century guns and bullets are far better than those of the 18th century. As compared with 1948–52, the Earl's parties put more effort into searching for wounded deer on subsequent days.

One factor probably contributing to the increases in deer seen and in deer killed was that the hunting parties killed virtually stags only; they took only five hinds as against 119 stags. As the killing rate to keep a population of Scottish red deer fairly stable has been found to be about one-sixth of the adult stock (Lowe, 1969), the Earl was greatly under-killing. Also, his notes on poachers and sheep show that he was deliberately fostering a big increase of deer.

Poachers, disturbance, and land use

In 1784, the first year in the journal, the Earl complained about poachers killing his stags. On 20 August 1784 he wrote 'in Binywriten (Beinn Bhrotain) and Glengusachen (Glen Geusachan), found a very large fine Hart in a hole in a Cairn, and after lying an hour watching him, on going

in found him Dead. He had been shot about ten days, saw only four Harts in bottom of Glengusachen, so that every thing in that corner is destroyed by Potchers'. The detailed information about what he did to stop poachers will be published in full elsewhere. It will suffice here to note that already in 1785 he had seized the guns of all people on Mar, and in 1786 he and the neighbouring laird of Invercauld compelled all male tenants to swear not to carry or use a gun for destroying red deer. Tenants were subsequently told they would be evicted if they even harboured poachers, let alone if they poached themselves. No doubt the extreme severity of these measures had the desired effect, and the Earl's journal contained no comments about poaching after 1785.

Deer shooters today often complain about hikers disturbing the deer they are about to shoot. Before the days of hikers the Earl complained too, but about local people. This illustrates the much heavier use of the hills in his day for sheep and cattle. Here are his complaints: 23 August 1785 'went to Cairn a vime, lost all my amusemment by Herds coming looking for sheep'; 30 September 'spied three men and a dog going down the glen (Geusachan) that had drove of every deer in that glen, went after the men and took them, found them Strathspey and Badenoch looking after flocks missing'; 29 August 1787 'when we were near a shot two women coming down glen Dee set them off so that I came home without firing a gun'; 20 August 1788 'went to Cairnavine (Carn a' Mhaim) after much fatigue every Deer was drove out of the hill and several good chances lost by Charles Macardy sending five men to look after sheep in the Forrest two going up one side of the hill, two the other and one on the top so that all my diversion for this day is spoiled'; 11 September 'a man coming with cattle from the Glen Gauldy came in sight and set them of'; and 31 August 1791 'the People looking for cattle set all the Deer off' (upper Quoich).

People were not the only form of disturbance of the Earl's stalking, however. He wrote that hinds set the stags off on 0, 2, 3, 0 and 6 occasions in 1784–88. This again indicates that hinds were increasing, and that their high numbers were making stag hunting difficult. Subsequently the Earl went much less to the hill, and the comments about hinds setting off the stags fell to 1, 0, and 2 in 1789–91. In 1786 he once wrote that the hunting party could not get near the stags because of hinds, and in 1791 noted this twice, 'such a number of hinds I could not get a shot' and 'no chance of harts for numbers of hinds'. On a third occasion in 1791, the deer were in such large droves that he could not get near them.

Evidently the Earl believed that sheep harmed his deer hunting. On 13 September 1791 he wrote that in Bynack and the Sgarsoch the ground was full of sheep. On the 15th he complained 'not one heart in all Binyvrotten (Beinn Bhrotain) nor the day before in Bynack . . . all spoiled with Charles Macardy's sheep'.

The Earl did not write about burning except in the glens south of Inverey. He noted on 20 September 1785 'very few (grouse) there owing to burning and Potchers' and on 12 August 1786 'the glens much burnt and may be preserved better'.

Trees

The Earl's comments show that young trees were growing, for example: . . . 17 August 1784 in Derry, 'above young firrs', 26 September 'above young firs in Glenquich' (Glen Quoich), 21 August 1786 'in the young firs above the sheels' (in Glen Quoich at the east end of Clais Fhearnaig), 22 August 'in quarry (corrie) next to the young firs' (in Derry), 4 September 'in rocks above young firs' (Creag Bad an t-Seabhaig north-west of Derry Lodge), 24 August 1789 'above young firs in the Dairy' (Derry). Obviously, these pine trees—locally called firs—had seeded before 1780, and were growing during the years of the Earl's journal.

DISCUSSION

Deer numbers

After the period covered by the Earl's journal, deer numbers evidently increased further. Scrope (1839) wrote that 'The number of deer . . . it is supposed that there may be a regular stock of about three thousand'. Mar was advertised in 1826, and claimed to be 'the finest shooting district in Scotland . . . filled to profusion with red deer of which there is supposed to be at least 3000' (McConnochie, 1923). In 1851, Captain Horatio Ross (unpublished letters) shot 118 deer in one season on Mar Forest, as many as the Earl's parties killed in eight seasons. About 1850, when the Duke of Leeds had the tenancy, he killed still more, 200 stags in one season, and it was estimated that 3000 deer were in Glen Quoich during one big deer drive with 25 beaters (McConnochie, 1923). McConnochie wrote that about that same time, one Braemar poacher had in ten years a bag of 300

stags and hinds, and 'one shepherd counted it a poor season when he did not bag 10 stags, not to mention hinds'.

In the late 19th–early 20th centuries, the Duke of Fife on one occasion shot 22 stags in one day, and 45 in three days; he killed about 4000 in his lifetime (McConnochie, 1923). Grimble (1896) stated that the annual kill of stags then was about 200, and 275 and 173 stags were shot in 1940 and 1950 (Whitehead, 1960). Clearly, high deer numbers have been maintained.

Human clearances

The Earl refers to seeing deer 'above the houses' in Glen Lui but makes no mention of people there. This fits Scrope's (1839) comment that Glen Lui 'was cleared of sheep and cattle etc, and turned into a forest upwards of sixty years ago (that is, before the Earl's journal), and the other glens (on Mar Forest) at different and more recent periods'. In 1726, Lord Grange proposed 'the clearance of Glen Lui in order to enhance the value of the property to a purchaser', the tenants to be ejected after their harvest was over (Michie, 1901). The Glen Lui farms were occupied again after that, and cleared once more, probably in 1763 when Luibeg was 'reserved for deer' (Anon., 1909), and certainly before Cordiner's (1780) visit in 1776. The eviction of farmers and their sheep and cattle opened up the most fertile arable valley soils to grassland and deer grazing, and probably did much to aid the increase in deer stocks. It also removed likely poachers living at the edge of what was then the best area for deer. Unlike the well-known clearances in Sutherland and the west Highlands, which were to make way for large-scale sheep farming (Hunter, 1976), the Glen Lui clearances and other clearances in the Braemar area were to provide better deer hunting.

Trees

In 1776, Cordiner (1780) passed Luibeg and noted 'many thousand stumps of trees, the remains of woods which have been floated down Lui Water to the Dee'. Much of the woodland in Luibeg and Glen Derry had been felled, and fellings obviously took place in Glen Quoich also. On 20 September 1788 the Earl wrote of Glen Quoich that 'a man from the Saw Miln came over the hill and set them (the deer) off'; this sawmill was at the

foot of Glen Quoich. Cordiner noted young regeneration in Glen Quoich, probably coming up after earlier fellings, and the evidence about the sawmill suggests that felling was still going on in 1788.

In their survey of the native Scottish pine woods, Steven & Carlisle (1959) found that most of the native pines on Mar were between 140 and 200 years old, and hence had seeded about 1760–1820; they saw only a few about 100 years old. Similarly, by counting rings on felled pines in the Derry–Luibeg woods in 1948, I found a median age of 181 years ($n = 6$, range = 160–189). Goodier & Bunce (1977), who calculated that trunk diameter in native pines is closely correlated with tree age, found no trees of small diameter in the native woods on Mar.

This lack of young trees is not due to a lack of seedlings. Where red deer are numerous during winter in woods in the Cairngorms area, as is the case in and near all the woods mentioned in this paper, it has been observed for decades that many pine seedlings occur, and some of birch and other species, but they become browsed down by red deer when they grow above the heather *Calluna vulgaris* and other ground vegetation (Gordon, 1925; Nethersole-Thompson & Watson, 1974). Counts of trees within plots on Mar showed nine trees of pine and birch, and nine seedlings, but only five ‘larger seedlings’ over 25 cm high, and no saplings over human breast height (Goodier & Bunce, 1977).

Steven & Carlisle (1959) wrote that there had been little successful regeneration for over 150 years, and ‘the heavy grazing by deer during that period is almost certainly the principal reason’. Gordon (1925) observed a rowan *Sorbus aucuparia* growing from an upturned pine root in Glen Derry. I have noticed that, outside fenced enclosures, the only young trees in all the native woods on Mar today have grown on cliffs, on rocks in rivers, and on the upturned roots of wind-blown old trees, all sites out of the reach of red deer. Such trees, which are nearly all pines, number a minute proportion of the total, much less than 1 %.

For conservation the obvious next step was to extend the area of ground protected from red deer. The Cairngorms National Nature Reserve, declared in 1954, contained some of the best stretches of native pine woodland on Mar. Since then the Nature Conservancy have not owned this area on Mar but have managed it under agreements with the landowners. In 1959 and 1960 the Nature Conservancy enclosed two small plots of 2.4 and 3.2 ha in lower Glen Derry and Luibeg with deer fences, and without burning, and by 1961 hundreds of seedlings had regenerated naturally (Nature Conservancy, 1961), inside these areas but

not outside. Although the density of seedling establishment was very low compared with a commercial plantation, the regeneration was more than enough to replace the forest. Subsequently, trees from local stock were planted densely in the plots, thus making it impossible to assess the long-term results of the original treatment. Nevertheless, Gordon's (1925) prediction that trees would become established if deer were fenced out had been confirmed in the short term.

Prevention of deer browsing may not be enough to allow good regeneration on ground near the woods if the heather and moss are too dense to allow seedling establishment, or in the woods if the mature pines are too close together and provide too much shade (Steven & Carlisle, 1959). In most springs between 1948 and 1963, Mr Robert Scott, who was deer stalker at Luibeg, burned large tracts of heather and other ground vegetation. He did this within open parts of the old wood in Glen Luibeg as well as on moorland adjacent to the old woods in Luibeg, Derry, Lui, Quoich and Dubh Ghleann. The size of a burned area varied from about 5 ha to over 100 ha. Numerous seedlings grew on these areas in the few years after burning, but not a single sapling resulted. Yet good regeneration has often occurred on such ground east of Ballater and further down Deeside, where there are few or no red deer (Nethersole-Thompson & Watson, 1974), and the best regeneration has been after fire. Obviously burning alone is not sufficient. On Mar, the evidence from the Earl's time, the many decades since, and recent years, all points to a scarcity or absence of deer being necessary for tree regeneration. This is sometimes sufficient (as in the fenced plots), though it may not be sufficient everywhere without ground treatments such as burning. Burning alone is obviously not sufficient, and with or without deer fencing is not necessary.

Forster & Morris (1977) have stated that, for the conservation of many of the native pine woods in north-east Scotland 'for practical purposes, it will be necessary to exclude red deer by fencing, or reduce their numbers to such low levels that the sporting value of adjacent land may be reduced, at least in the short term'. In the Mar woods mentioned in this paper, neither has happened.

Other native woods

It is worth considering to what extent this account of events on Mar is representative of other old native pine woods in the Scottish Highlands.

The data of Goodier & Bunce (1977) on the trunk diameter of pines in different woods are highly relevant. Their samples of the trunk diameter of pines at Ballochbuie, on Balmoral estate east of Braemar, showed a similar distribution to Mar, though slightly less skewed towards wider, 'older' classes. Some other samples, from Glen Feshie, Meggernie, Strathfarrar, and Coulin further west in the Highlands, also showed a similar, skewed distribution, though considerably less so than at Mar. In my opinion this parallels a heavier browsing pressure by deer at Mar than at the other places. A fact that may help to explain this extreme distribution of the native trees on Mar is that the Forest of Mar was formerly one of Scotland's royal forests, and Whitehead (1960) wrote that for many years it has 'held the distinction of being the largest and most important' deer forest in Scotland ('forest' in this sense means an area for deer, not a wood, and most deer-forest ground in the Scottish Highlands, including Mar, has no trees). Nevertheless, a common characteristic shared by all the places named above is heavy browsing from high stocks of red deer.

The fostering of red deer that occurred in the Earl's days on Mar also occurred elsewhere in Deeside. As mentioned above, the laird of Invercauld combined with the Earl in severe measures against poaching, so this applied to the whole of Aberdeenshire west of about Ballater on the north side of Dee, and west of Balmoral (including Ballochbuie) on the south side. At Abernethy on the Spey side of the Cairngorms massif, red deer were being carefully preserved at the beginning of the 19th century (Whitehead, 1960), and Rothiemurchus on the Spey side became a deer forest in 1843. The deer-forest expansion reached a high rate in the middle decades of the 19th century, when farmers were evicted in clearances for deer at Glen Feshie, Glen Ey and elsewhere (Nethersole-Thompson & Watson, 1974). Thus, Mar was only one of an early group of areas to be developed as deer forests in the Earl's time, and in the subsequent few decades the process became widespread.

Conclusion

The native pine regeneration noted in the late 18th century on Mar has been prevented since then, by the rapid increase of red deer fostered by the Earl's actions against poachers and by the subsequent high stocks maintained by his successors in Mar. Similar events help explain the lack of regeneration in some other native woods.

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